

AJHajh-20220125-ArunCrem Planning Response_LPA.docx

25th January 2022

Simon J Davis
Principal Planning Officer
Arun District Council
Civic Centre
Maltravers Rd
Littlehampton
West Sussex
BN17 5LF

Dear Simon,

Y/184/21/DOC – CONDITIONS 8, 9 AND 10: DRAINAGE RESPONSE

Thank you for returning comments from your Drainage Engineer pertaining to planning conditions 8, 9 and 10 under planning permission Y/184/21/DOC for the Crematorium, Bognor.

For clarity, the original comments contained in the email response of 11th January 2022 have been copied out in full below and each addressed in turn in the same order.

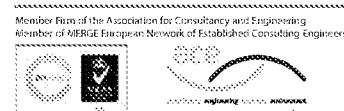
Comments in full, as received:

Thank you for consulting us, we have the following comments regarding conditions 8, 9, and 10.

Engineers Comments Regarding Condition 8

1. *Please supply results of winter groundwater monitoring and winter infiltration testing.*
2. *Please supply calculations to support design.*
3. *Please supply an impermeable area catchment plan.*
4. *Please label all pipes with diameter and fall.*
5. *Hydrobrake unit references should be included on layout plans.*
6. *Please label finish and formation level of permeable paving.*
7. *Gullies and channel drains should be labelled with cover levels.*
8. *The gabion outfall construction detail drawing is unclear. Is it proposed to have buried pipes discharging to the basin?*

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Square, London SE1 3UN



9. Please supply site specific construction details of the attenuation basin, showing invert level, top of bank level, width at bed and width at bank.

We would strongly recommend that the applicant reviews and completes our surface water drainage checklist when preparing the revised information. Our checklist fully details our requirements for a discharge of condition application. Our checklist can be found here: [Drainage Planning Consultations | Arun District Council](#)

Engineers Comments Regarding Condition 9

1. Please supply evidence of consent applications for the new ditch, and headwall to the existing ditch.
2. Please supply a buffer plan to show that at least 3m is being provided between top of bank of watercourses and obstructing features, such as fences, buildings, and basins.

Engineers Comments Regarding Condition 10

1. Review of the maintenance manual will occur once the drainage design has been agreed.

CampbellReith's response to Condition 8:

1. Winter groundwater monitoring and infiltration/percolation testing was undertaken on several occasions previously. Details and results are contained within Land Quality Statement submitted as part of original application (ref 13591-CRH-XX-XX-RP-GE-0002 Revision D02), relevant extracts attached to this letter. Previous correspondence between ADC Drainage Engineer and CampbellReith is also enclosed for context.
2. Please see enclosed drainage calculations (13591-CRH-XX-XX-CA-C-0005 Revision P1) showing proposed attenuation and discharge volumes. Total storage requirement is equivalent to approximately 530m³. The results show how this equates to an average depth of no more than 350mm over the whole basin footprint of 1,400m² and accounting for the banks. The volume of storage takes account of the high groundwater and only refers to available volume above the highest recorded groundwater level. Note that the volume of storage provided within the basin does not account for the upstream storage within the permeable paving (112 m³) and swales (240 m³) in the calculations. In dry conditions, taking account of upstream storage there is more than sufficient volume to accommodate all storms up to and including the 1 in 100 year storm +40% climate change with runoff restricted to QBar for all events.
3. Please see enclosed impermeable area plan 13591-CRH-XX-XX-DR-C-5250 Revision P1.
4. Additional pipe labels have been added to drainage layout plans 13591-CRH-XX-XX-DR-C-5050 Revision P6 and 5051 Revision P5. Gradients for short (<5m) pipe lengths have not been shown. Pipe sizes, maximum grades and materials are to be as specified on drainage notes drawing 13591-CRH-XX-XX-DR-C-5300 Revision P1 previously provided.
5. Details have been added to updated drainage layout plan 13591-CRH-XX-XX-DR-C-5051 Revision P5.
6. Permeable pavement details have been previously provided on detail drawing 13591-CRH-XX-XX-DR-C-5350 Revision P2. This includes depths of proposed pavement build-up. The proposed surface levels can

be obtained from levels plan *13591-CRH-XX-XX-DR-C-5200 Revision P3* and sub base levels inferred (Minor updates to Revision P3 enclosed for completeness).

7. Cover levels have been provided for proposed gullies on updated drainage layout plan *13591-CRH-XX-XX-DR-C-5050 Revision P6* and *5051 Revision P5*. Channel drain cover levels will necessarily vary along the length and hence have not been provided. Exact levels will be determined by contractor to suit the finished levels as shown on levels plan *13591-CRH-XX-XX-DR-C-5200 Revision P3*.
8. The gabion basket is to be built into the embankment and to be exposed so as to be accessible for maintenance. The pipework will be within the basket and wrapped in a permeable membrane to prevent build-up of fines. The gabion provides siltation protection as well as dispersal of incoming flow to reduce scour. The gabion basket also removes the need for a traditional headwall and grille, reduces the maintenance requirements and provides a bigger area of contact/surface flow.
9. Please see enclosed basin detail drawing *13591-CRH-XX-XX-DR-C-5310 Revision P1*.

CampbellReith response to Condition 9:

1. OWC application for the discharge headwall from the basin was formally submitted in September 2021 together with all information requested by Paul Cann as per his email of 11th August 2021. Referring to Land Drainage Act 1991 Section 23(3), could you please confirm when consent letter will be issued?
2. The OWC consent for the new ditch is as shown on the attached consent (Consent Number LDC/ARUN/2021/015)
3. A suitable buffer has been provided between top of basin and edge of watercourse to allow for maintenance, as shown on drawing *13591-CRH-XX-XX-DR-C-5051 Revision P5*.

CampbellReith response to Condition 10:

1. Noted, but please let us know if there are any comments once you have reviewed the information provided.

I trust the above is sufficient to address your comments. However, please let us know if you require any further information.

Yours sincerely



ANDY HIGGINS

For and on behalf of **CAMPBELL REITH HILL LLP**

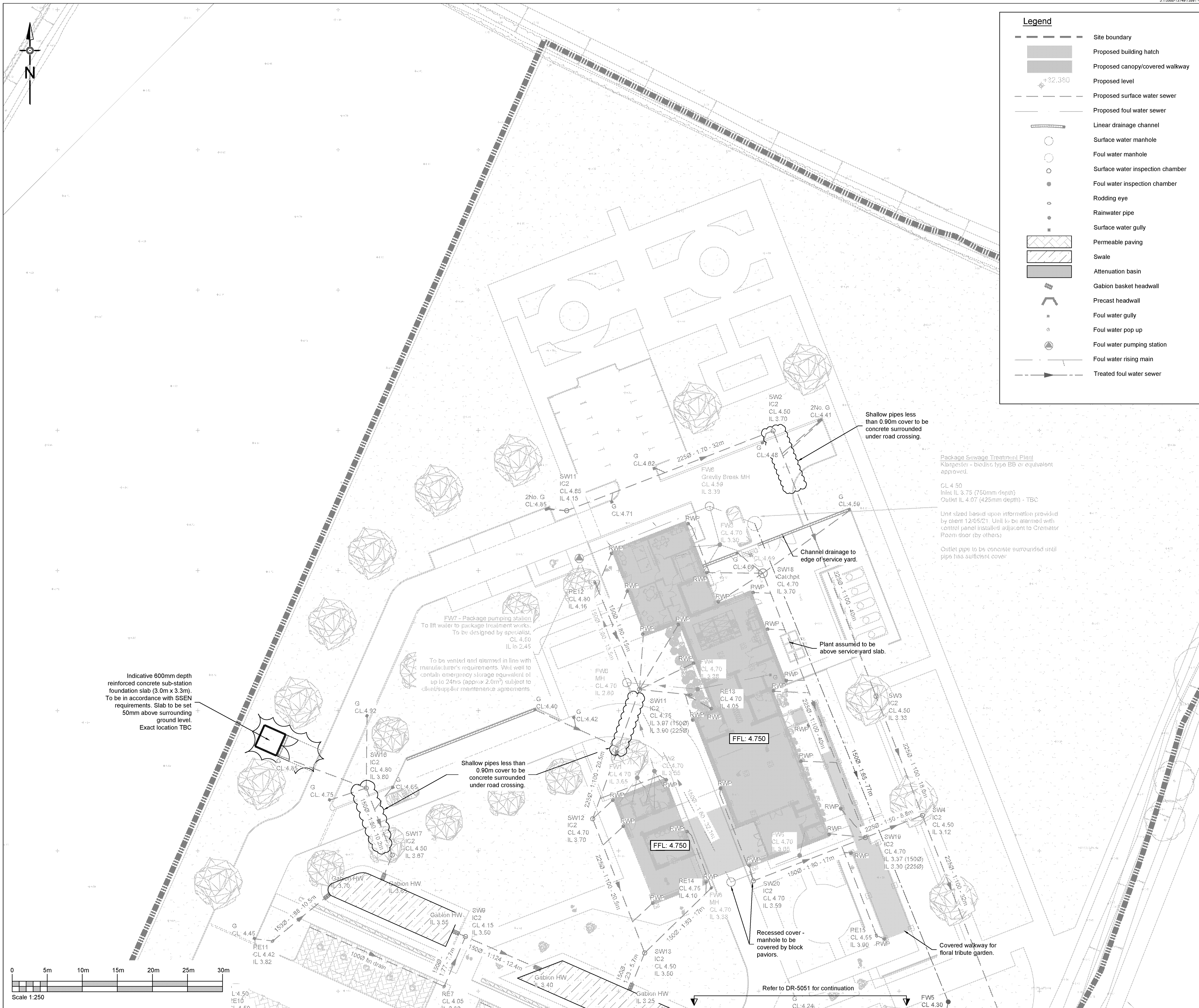
cc

Lisa Jackson (Jackson Planning)

Jonathan Stone (Westerleigh Group Ltd)

Encl.

- 13591-CRH-XX-XX-DR-C-5050-P6_Proposed Drainage Layout (Sheet 1)
- 13591-CRH-XX-XX-DR-C-5051-P5_Proposed Drainage Layout (Sheet 2)
- 13591-CRH-XX-XX-DR-C-5200-P3_Proposed Levels
- 13591-CRH-XX-XX-DR-C-5250-P1_Proposed Catchment Plan
- 13591-CRH-XX-XX-DR-C-5310-P1_Proposed Basin Details
- 13591-CRH-XX-XX-CA-C-0005-P1_Proposed SW drainage Calcs
- LDC/ARUN/2021/015 – Consent Letter and Conditions
- 13591 EMAIL_in (ADC) re.Groundwater monitoring 20190306
- Extracts from Land Quality Statement 13591-CRH-XX-XX-RP-GE-0002_Revision D02



Notes

1. Do not scale from this drawing on print or electronically. Work from figured dimensions only.
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3. Read this drawing with all Architect's, Service Engineer's and CampbellReith's relevant details, specifications and drawings.
4. All work is to be done in accordance with the relevant specifications issued by CampbellReith, British Standard Codes of Practice, Statutory Requirements and the Contract Documents.
5. **Drawing status:**
- | | |
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| P: Preliminary | Evolving drawings for approvals, tenders, billings etc. |
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6. Only status C drawings to be used for construction.
7. Suitability code:
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- Construction
- A** - For construction, **B** - For construction but with comments (i.e. areas in abeyance), **CR** - Construction Record (Final Construction ONLY. Any deviations to that which is on site is not the liability of CampbellReith)
8. Site layout taken from drawing *154380_001_Site & Boundary Plan* by Stride-Treglown as issued 18/11/21
9. For landscaping details refer to Indigo Landscaping Plan 954-MP-01.
10. For S278 details refer to Paul Basham Associates' plans.
11. For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350
12. It is assumed that no threshold drainage is required.
13. Final site layout to be confirmed by architect/landscape architect and SVP locations to be confirmed by M&E engineer.
14. Foul Treatment to be provided by Klargester Bioddisc BB or equivalent approved. Assumed maximum loading based upon information provided by client in May 2021. To be adequately vented and alarmed as per manufacturer's recommendations. Exact location TBC.
15. As noted in Factual Ground Investigation Report GL24235 by Harrisons (dated May 2021) there is a medium risk of volume change potential soils on site. Therefore appropriate measures should be taken into account within foul and surface water drainage design including increased gradients and rocker pipes. Refer to drawings 13591-CRH-XX-XX-DR-C-5300 to 5304 for details.
16. All manholes/inspection chambers under areas subject to vehicular loading (including footways adjacent to roads) to be load class D400. Cover levels in areas subject to pedestrian loading only to be B125 class.

P6

P6	Revised to suit LLFA comments	21.01.22	SH
P5	RWP added as clouded. Reissued for Tender	25.11.21	AJH
P4	VE updates incorporated. Reissued for Tender	24.11.21	SH
P3	Client comments added. Reissued for Tender	15.09.21	AN
P2	Issued for Tender	09.07.21	SH
P1	Issued for Tender	05.07.21	AJH
Rev	Description	Date	By

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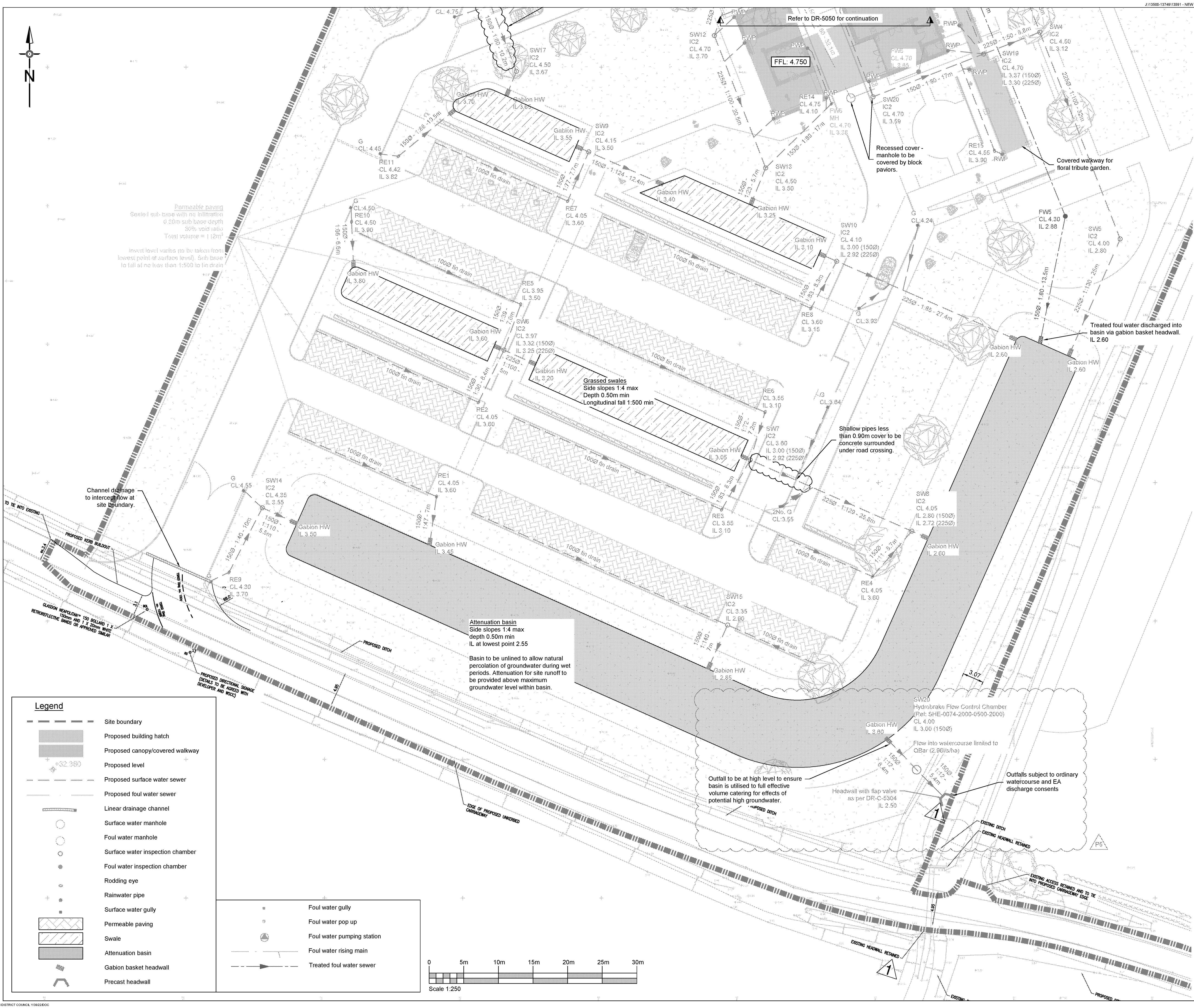
Job Title **Central Arun Crematorium**

Client **Westerleigh**

Proposed Foul and Surface
Water Drainage Layout
(Sheet 1 of 2)

Drawn by AJH	Date made June'21	Scale @ A1 1:250	Checked by AJH	Suitability S2	CR Project 13591
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Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5050	P6



Legend

- Site boundary
- Proposed building hatch
- Proposed canopy/covered walkway
- Proposed level
- Proposed surface water sewer
- Proposed foul water sewer
- Linear drainage channel
- Surface water manhole
- Foul water manhole
- Surface water inspection chamber
- Foul water inspection chamber
- Rodding eye
- Rainwater pipe
- Surface water gully
- Permeable paving
- Swale
- Attenuation basin
- Gabion basket headwall
- Precast headwall
- Foul water gully
- Foul water pop up
- Foul water pumping station
- Foul water rising main
- Treated foul water sewer

- Notes**

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 - Drawing status:**
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 - For landscaping details refer to Indigo Landscaping Plan 954-MP-01.
 - For S278 details refer to Paul Basham Associates' plans.
 - For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350
 - It is assumed that no threshold drainage is required.
 - Final site layout to be confirmed by architect/landscape architect and SVP locations to be confirmed by M&E engineer.
 - Foul Treatment to be provided by *Klargester Biddisc BB* or equivalent approved. Assumed maximum loading based upon information provided by client in May 2021. To be adequately vented and alarmed as per manufacturer's recommendations. Exact location TBC.
 - As noted in *Factual Ground Investigation Report GL24235* by Harrisons (dated May 2021) there is a medium risk of volume change potential soils on site. Therefore appropriate measures should be taken into account within foul and surface water drainage design including increased gradients and rocker pipes. Refer to drawings 13591-CRH-XX-XX-DR-C-5300 to 5304 for details.
 - All manholes/inspection chambers under areas subject to vehicular loading (including footways adjacent to roads) to be load class D400. Cover levels in areas subject to pedestrian loading only to be B125 class.
 - Pipes with no specified diameter are to be 150mm for surface and 100mm for foul unless specified otherwise.

P5	Revised to suit LLFA comments - pipe details and basin information added	21.01.22	SH
P4	VE updates incorporated. Reissued for Tender	24.11.21	SH
P3	Client comments added. Reissued for tender	15.09.21	AN
P2	Issued for Tender	09.07.21	SH
P1	Issued for Tender	05.07.21	AJH
Rev	Description	Date	By

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Job Title

Central Arun Crematorium

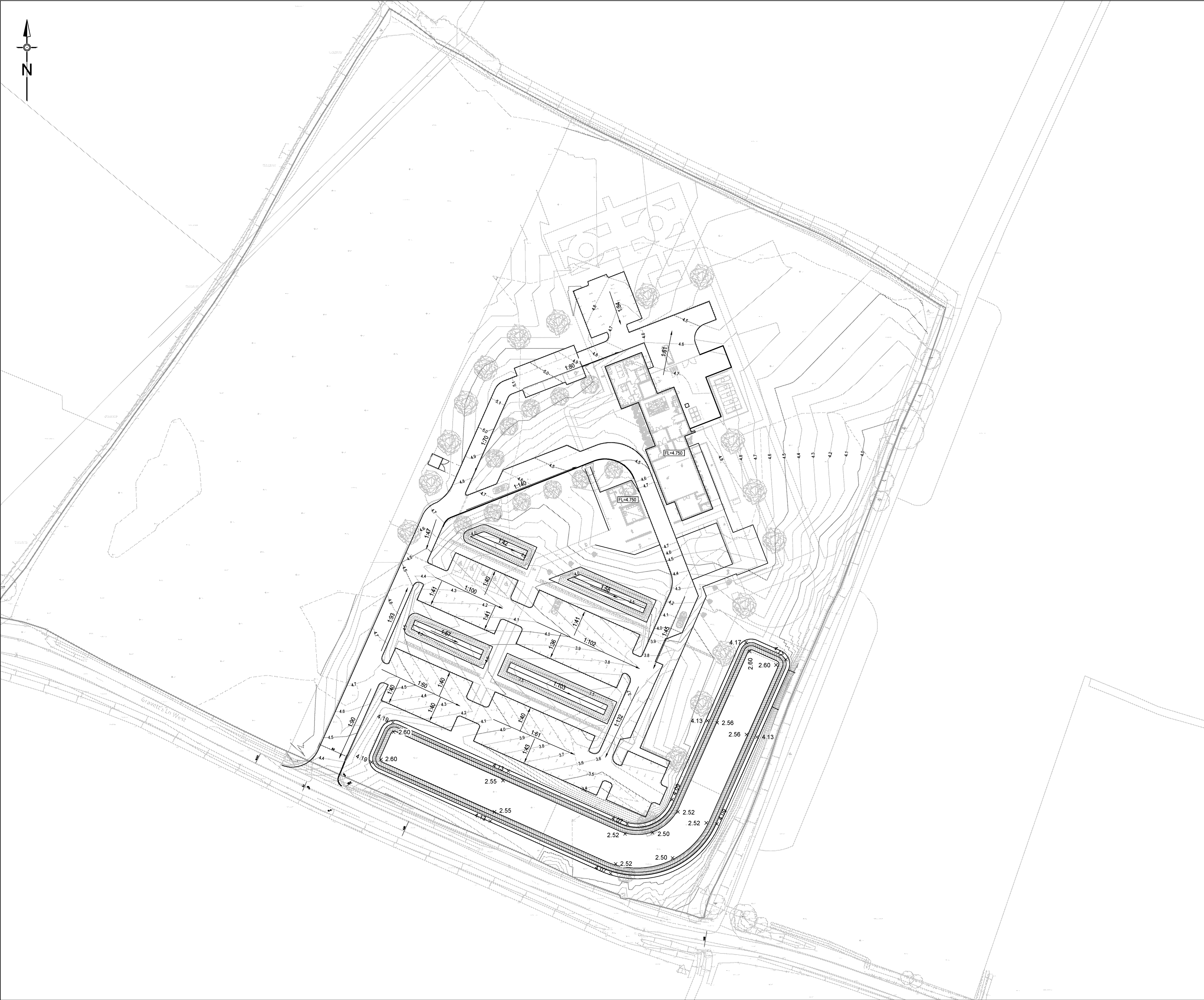
Client

Westerleigh

Proposed Foul and Surface Water Drainage Layout (Sheet 2 of 2)

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
AJH	June'21	1:250	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5051	P5



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7. Suitability code:

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Construction

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LEGEND

- SITE BOUNDARY
- 4.0 ----- PROPOSED LEVELS MAJOR CONTOURS
- 4.1 ----- PROPOSED LEVELS MINOR CONTOURS
- FL-3.418** PROPOSED FINISHED LEVELS
- 4.0 ----- EXISTING CONTOURS
- 1:100 FALL DIRECTION/GRADIENT
- x 3.43 PROPOSED SPOT LEVEL

P3	Updated to suit planning comments.	25/01/22	AJH
P2	Updated to suit site layout. Issued for tender	24/11/21	JA
P1	Issued for Information	04/08/21	MW
Rev	Description	Date	By

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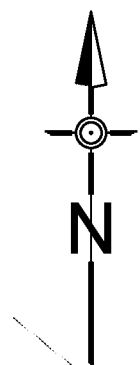
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Client	Westerleigh

Proposed Finished Levels Layout

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
JMc	June'21	1:500	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	ZZ	XX	DR	C	5200	P3



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9. For S278 details refer to Paul Basham Associates' plans.
10. For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350

LEGEND

	Site boundary (2.765 ha)
	Proposed buildings (0.064 ha)
	Proposed Canopy (0.018 ha)
	Macadam pavement construction (0.318 ha)
	Permeable block paving (0.125 ha)
	Pedestrian block paving (impermeable) (0.061 ha)
	Pedestrian tarmac footpath (0.042 ha)
	Concrete service yard (0.026 ha)

TOTAL impermeable = 0.654 ha
% impermeable = 23.6%

P1	Issued for Information	25.01.22	SH
Rev	Description	Date	By

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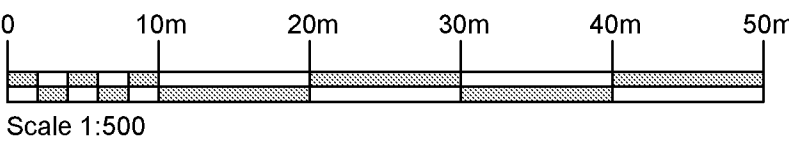
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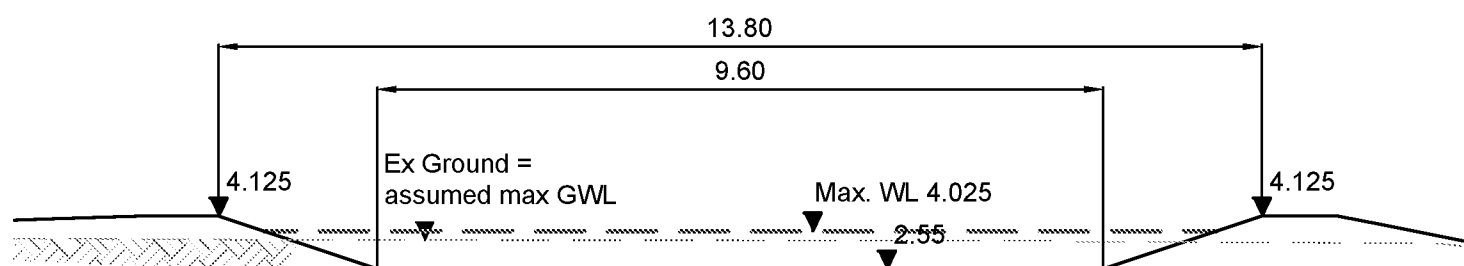
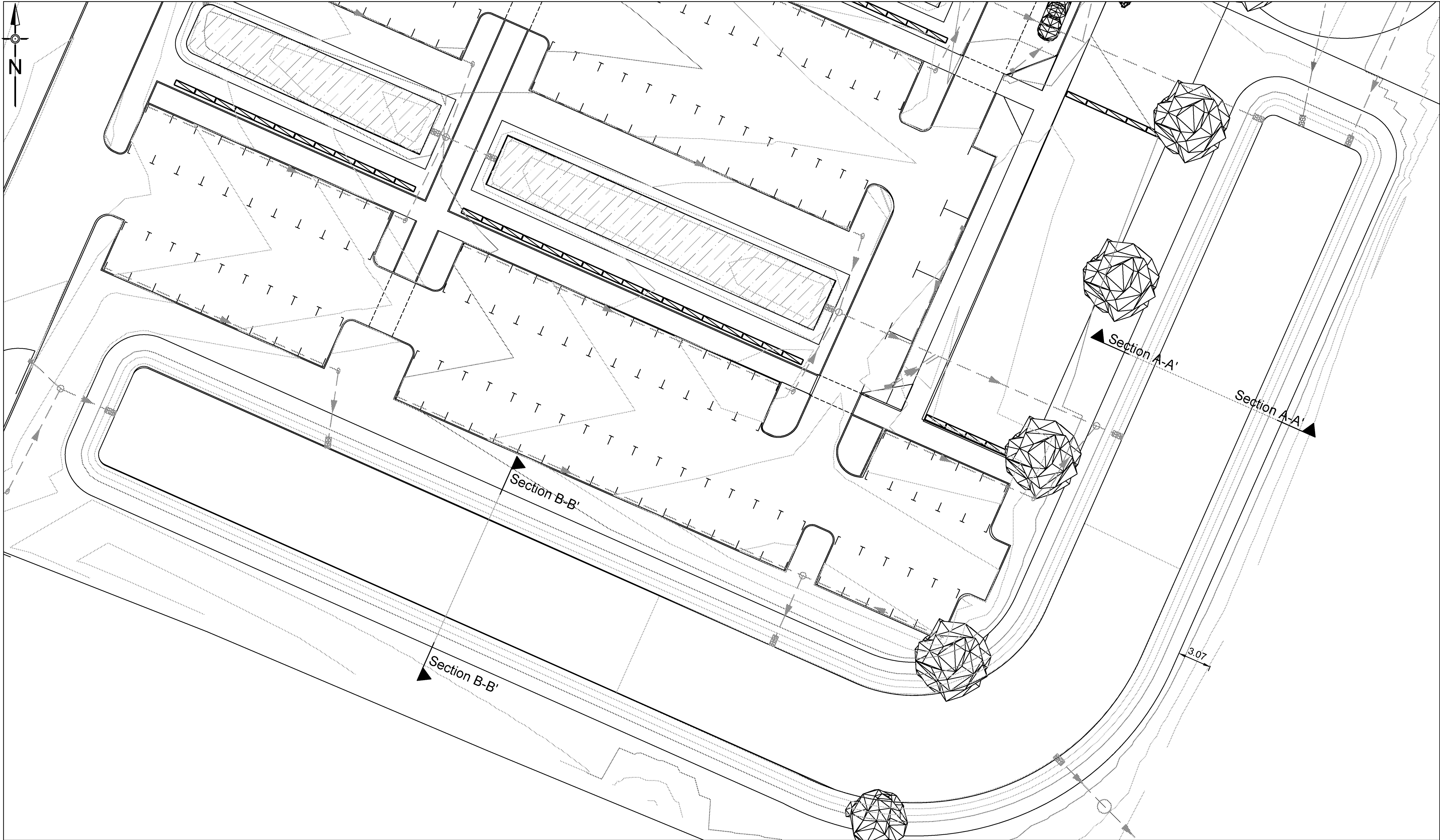
Job Title	Central Arun Crematorium
Client	Westerleigh

Proposed Impermeable Areas

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
SH	June'21	1:500	AJH	S2	13591

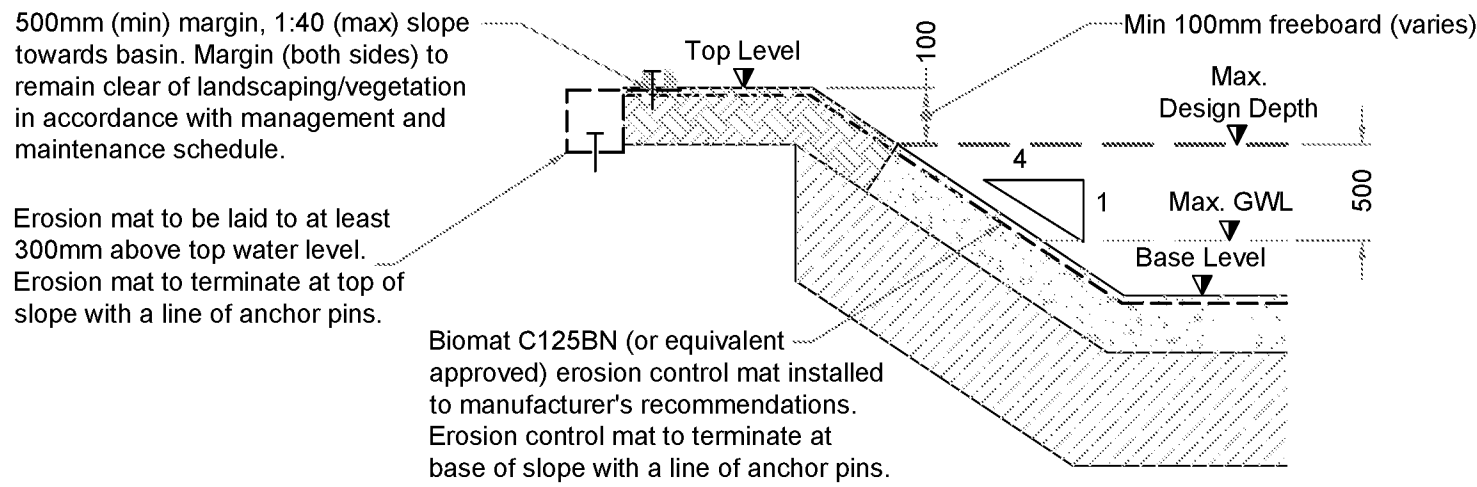
Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5250	P1





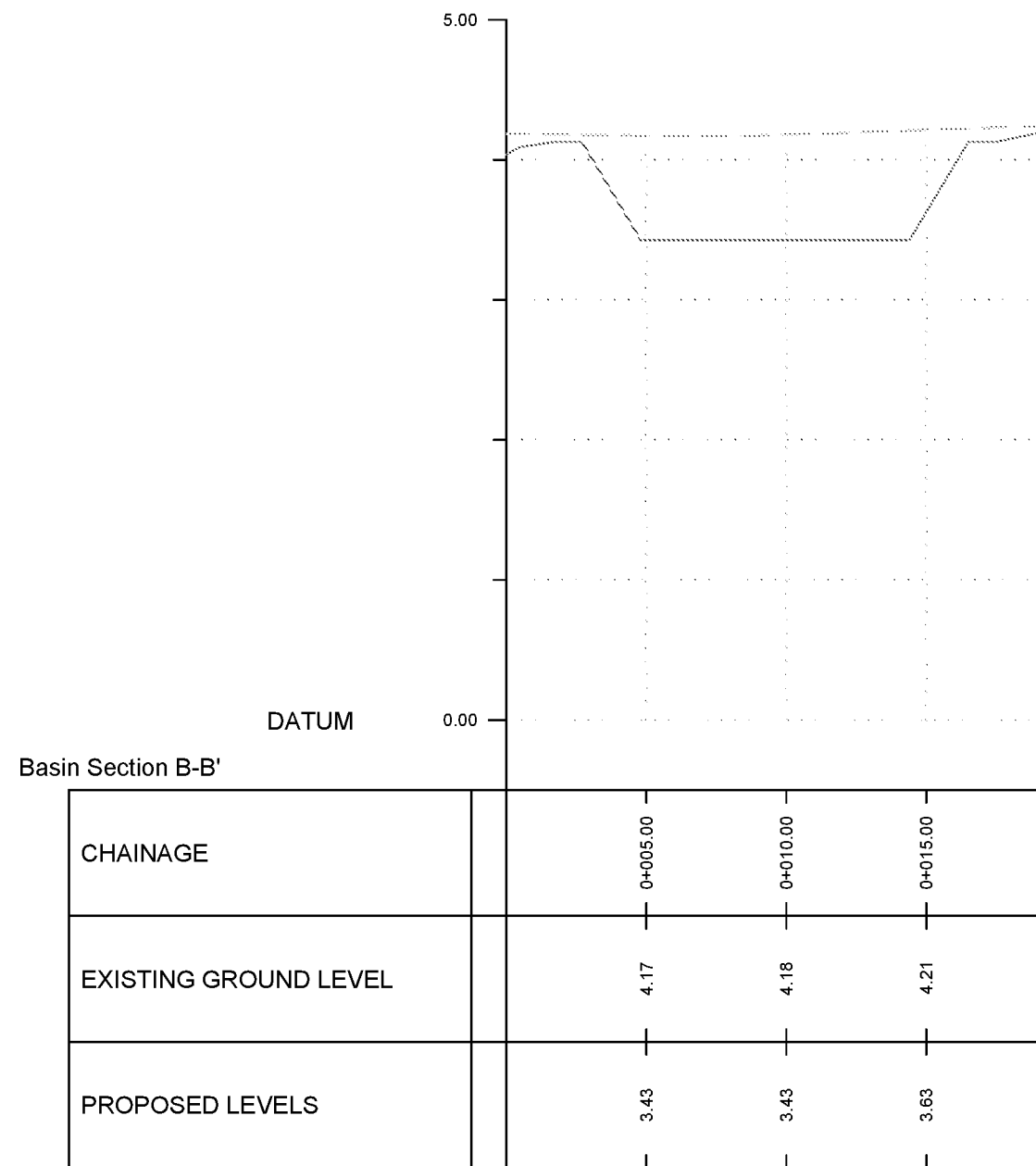
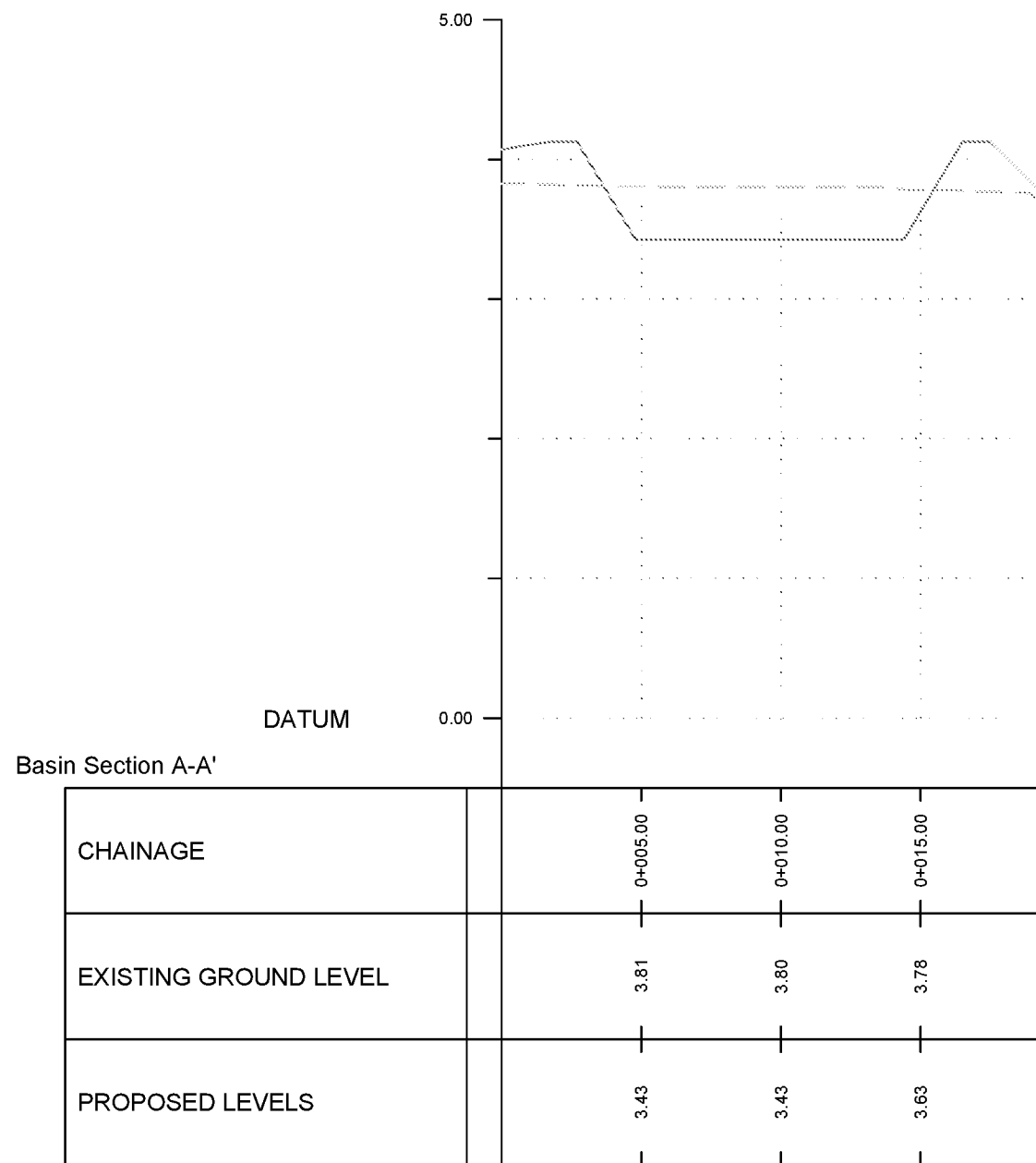
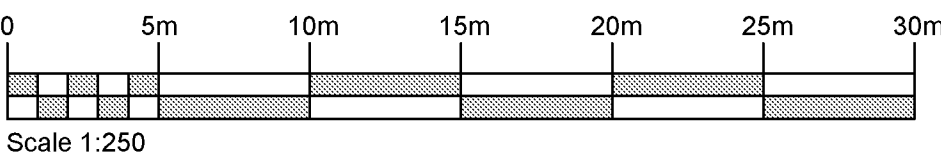
Typical Section

Scale 1:100



Erosion Mat Detail

Scale 1:20



Notes

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- For S278 details refer to Paul Basham Associates' plans.
- For pavement and surfacing details refer to drawing 13591-CRH-XX-XX-DR-C-5350

LEGEND

- PROPOSED VERTICAL PROFILE
- EXISTING GROUND LEVEL

P1	Issued for planning discharge	25.01.22	SH
Rev	Description	Date	By

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Client	Westerleigh

Drainage Construction Details Proposed Basin Detail

Drawn by	Date made	Scale @ A1	Checked by	Suitability	CR Project
SH	Jan '22	1:250	AJH	S2	13591

Project No.	Originator	Volume	Lvl/Loc	Type	Role	Number	Rev
13591	CRH	XX	XX	DR	C	5310	P1

Arun Crematorium

Design Calculations

13591 - Proposed Surface Water Network
Rev P1

Date: 25/01/22

Project No: 13591

Engineer: A. Higgins

Checked: B. Sathan

Campbell Reith Hill LLP
Raven House
29 Linkfield Lane
Redhill
Surrey RH1 1SS

CampbellReith		Page 1
Raven House 29 Linkfield Lane Surrey RH1 1SS	13591 Arun Crematorium Proposed SW Basin	
Date 25/01/2022 16:33 File 13591-CRH-XX-XX-CA-C-0005-P1_P...	Designed by AJH Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	3.720	0.120	2.0	171.9	O K
30 min Summer	3.759	0.159	2.0	229.8	O K
60 min Summer	3.801	0.201	2.0	292.7	O K
120 min Summer	3.836	0.236	2.0	345.1	Flood Risk
180 min Summer	3.856	0.256	2.0	375.7	Flood Risk
240 min Summer	3.869	0.269	2.0	396.0	Flood Risk
360 min Summer	3.884	0.284	2.0	420.1	Flood Risk
480 min Summer	3.893	0.293	2.0	433.8	Flood Risk
600 min Summer	3.899	0.299	2.0	442.3	Flood Risk
720 min Summer	3.902	0.302	2.0	447.6	Flood Risk
960 min Summer	3.905	0.305	2.0	452.4	Flood Risk
1440 min Summer	3.904	0.304	2.0	450.7	Flood Risk
2160 min Summer	3.896	0.296	2.0	438.1	Flood Risk
2880 min Summer	3.890	0.290	2.0	428.5	Flood Risk
4320 min Summer	3.881	0.281	2.0	414.7	Flood Risk
5760 min Summer	3.873	0.273	2.0	403.0	Flood Risk
7200 min Summer	3.867	0.267	2.0	393.6	Flood Risk
8640 min Summer	3.862	0.262	2.0	385.8	Flood Risk
10080 min Summer	3.858	0.258	2.0	379.3	Flood Risk
15 min Winter	3.734	0.134	2.0	192.6	O K
30 min Winter	3.778	0.178	2.0	257.5	O K
60 min Winter	3.825	0.225	2.0	328.2	O K
120 min Winter	3.863	0.263	2.0	387.3	Flood Risk
180 min Winter	3.886	0.286	2.0	422.0	Flood Risk
240 min Winter	3.901	0.301	2.0	445.3	Flood Risk
360 min Winter	3.918	0.318	2.0	473.3	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	141.120	0.0	118.7	19
30 min Summer	94.640	0.0	152.7	34
60 min Summer	60.620	0.0	254.2	64
120 min Summer	36.120	0.0	294.8	124
180 min Summer	26.484	0.0	313.2	184
240 min Summer	21.140	0.0	320.9	244
360 min Summer	15.237	0.0	322.3	362
480 min Summer	12.021	0.0	317.7	482
600 min Summer	9.986	0.0	312.6	602
720 min Summer	8.575	0.0	307.6	722
960 min Summer	6.738	0.0	298.0	962
1440 min Summer	4.807	0.0	280.0	1440
2160 min Summer	3.446	0.0	551.3	1860
2880 min Summer	2.739	0.0	559.1	2220
4320 min Summer	2.011	0.0	521.2	2984
5760 min Summer	1.636	0.0	754.8	3808
7200 min Summer	1.408	0.0	808.9	4680
8640 min Summer	1.254	0.0	858.9	5456
10080 min Summer	1.144	0.0	901.0	6344
15 min Winter	141.120	0.0	132.4	19
30 min Winter	94.640	0.0	162.7	34
60 min Winter	60.620	0.0	281.3	64
120 min Winter	36.120	0.0	317.7	122
180 min Winter	26.484	0.0	327.4	182
240 min Winter	21.140	0.0	326.6	240
360 min Winter	15.237	0.0	320.2	358

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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591 Arun Crematorium Proposed SW Basin	
Date 25/01/2022 16:33 File 13591-CRH-XX-XX-CA-C-0005-P1_P...	Designed by AJH Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
480 min Winter	3.929	0.329	2.0	489.8	Flood Risk
600 min Winter	3.936	0.336	2.0	500.5	Flood Risk
720 min Winter	3.940	0.340	2.0	507.7	Flood Risk
960 min Winter	3.945	0.345	2.0	515.7	Flood Risk
1440 min Winter	3.947	0.347	2.0	519.0	Flood Risk
2160 min Winter	3.942	0.342	2.0	510.0	Flood Risk
2880 min Winter	3.932	0.332	2.0	493.9	Flood Risk
4320 min Winter	3.917	0.317	2.0	470.7	Flood Risk
5760 min Winter	3.904	0.304	2.0	449.9	Flood Risk
7200 min Winter	3.891	0.291	2.0	431.0	Flood Risk
8640 min Winter	3.880	0.280	2.0	413.7	Flood Risk
10080 min Winter	3.870	0.270	2.0	398.0	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
480 min Winter	12.021	0.0	313.7	476
600 min Winter	9.986	0.0	307.6	594
720 min Winter	8.575	0.0	301.9	710
960 min Winter	6.738	0.0	291.8	942
1440 min Winter	4.807	0.0	274.8	1400
2160 min Winter	3.446	0.0	584.3	2072
2880 min Winter	2.739	0.0	569.4	2656
4320 min Winter	2.011	0.0	527.8	3284
5760 min Winter	1.636	0.0	844.5	4208
7200 min Winter	1.408	0.0	904.1	5112
8640 min Winter	1.254	0.0	957.2	5968
10080 min Winter	1.144	0.0	995.5	6856

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XP Solutions	Source Control 2020.1	

Rainfall Details

Rainfall Model	FEH	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
FEH Rainfall Version	2013	Cv (Winter)	0.840
Site Location	GB 498000 101400 SU 98000 01400	Shortest Storm (mins)	15
Data Type	Catchment	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.654

Time (mins)	Area
From:	To: (ha)

0	4 0.654
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Raven House 29 Linkfield Lane Surrey RH1 1SS	13591 Arun Crematorium Proposed SW Basin	
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XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 4.125

Tank or Pond Structure

Invert Level (m) 3.600

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1400.0	0.500	1677.8	0.501	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0074-2000-0500-2000
Design Head (m) 0.500
Design Flow (l/s) 2.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 74
Invert Level (m) 3.600
Minimum Outlet Pipe Diameter (mm) 100
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.500	2.0	Kick-Flo®	0.342	1.7
Flush-Flo™	0.149	2.0	Mean Flow over Head Range	-	1.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.9	0.800	2.5	2.000	3.8	4.000	5.2	7.000	6.8
0.200	2.0	1.000	2.7	2.200	3.9	4.500	5.5	7.500	7.1
0.300	1.8	1.200	3.0	2.400	4.1	5.000	5.8	8.000	7.3
0.400	1.8	1.400	3.2	2.600	4.3	5.500	6.1	8.500	7.5
0.500	2.0	1.600	3.4	3.000	4.6	6.000	6.3	9.000	7.8
0.600	2.2	1.800	3.6	3.500	4.9	6.500	6.6	9.500	8.0

To

Cc

Bcc

Subject Fw: Groundwater monitoring data

From: "Laura Gibbons" <Laura.Gibbons@arun.gov.uk>
To: [REDACTED]
Cc: "David Easton" <David.Easton@arun.gov.uk>, "Simon Davis" <Simon.Davis@arun.gov.uk>
Date: 06/03/2019 16:59
Subject: RE: Groundwater monitoring data

Hi Bava,

Thank you for sending me the groundwater monitoring results.

It is probably worth me stating that across other sites in the district there has been a secondary peak. So it will be interesting to see further results when they come in. I would also state that looking at our own borehole records groundwater levels haven't come up to absolute worst case levels but I believe that levels have been slightly higher than other recent winters.

Infiltration testing must be completed, it must be proved that infiltration doesn't work before we move on to allowing the next method for surface water disposal. Stating that the underlying geology is unlikely to support infiltration is not sufficient. Therefore, please ensure infiltration testing is completed above maximum recorded groundwater levels and before the end of March.

I am out of the office tomorrow, but should you wish to discuss this further feel free to give me a call.

Kind Regards,

Laura Gibbons, MEng, GMICE
Engineer (Drainage & Coastal)

Laura Gibbons | Engineer (Drainage & Coastal), Engineering Services, Arun District Council | Location: First Floor,
Arun Civic Centre, Maltravers Road, Littlehampton, BN17 5LF
Internal: 37818 | External: +44 (0) 1903 737818 | Fax: +44 (0) 1903 716018 | E-mail:
laura.gibbons@arun.gov.uk
Arun is Working in Partnership with Chichester District Council
Visit Arun's web site at <http://www.arun.gov.uk/> and www.chichester.gov.uk



Save the environment - think before you print.

From: BavaSathan@campbellreith.com [mailto:BavaSathan@campbellreith.com]
Sent: 06 March 2019 14:01
To: Laura Gibbons
Subject: Groundwater monitoring data

Good afternoon Laura,

Your Reference: Y/103/18/PL (Central Arun Crematorium) and Y/92/17/OUT (Land east of Drove Lane Yapton)

Further to previous discussions and planning applications relating to the above two sites, we have now received the preliminary report of the winter groundwater monitoring for both Yapton and Arun Crematorium, together with the additional monitoring results for January and February data for both sites. We have reviewed the information and discussed extensively with our Geotechnical colleagues to appraise of the outcome of the monitoring information and way forward.

You will note that on both sites the highest groundwater level was recorded in December 2018 which corresponds with the weather pattern. The Met office data indicate that the area received 101mm of rainfall in December compared to only 33mm in January. The shallowest recording at Yapton site is 0.34m below ground and 1.02m below ground level at Arun Crematorium site. Reviewing the borehole logs indicate that both sites are underlain by clay at those levels where groundwater has been recorded. The groundwater monitoring contractor is due to go back onsite for undertaking the March monitoring reading. As we have had a rather dry winter, we do not anticipate the water level to rise significantly above what has already been recorded.

Reviewing of the borehole logs for both sites, as mentioned above, there is significant presence of clay formation above the highest groundwater level recorded. We do not anticipate that the upper layers of soil will be productive enough or achieve significant infiltration rates. We do not propose for the basins to be lined to allow for natural infiltration for most of the year to take place and replenish the natural resources. However this will likely lead to some localised water accumulations within the respective basins over the winter months and groundwater is high. Instead of having an overflow system (as previously indicated in the drainage strategies for the respective sites), we would replace this by an actual outfall into the existing watercourses to provide positive discharge at the agreed discharge rate.

We welcome your views and comments on the attached monitoring data and factual reports. Based upon the information and as noted above, we propose not to undertake the scheduled infiltration tests and seek your approval to same. Once you have had a chance to review the information, I would welcome the opportunity to review/discuss those with you over a telephone conversation.

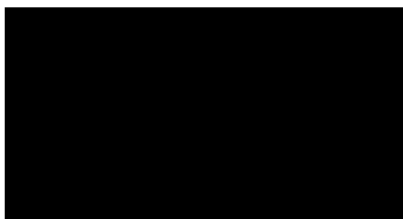
Do not hesitate to contact me if you require any additional information.

Kind regards,

Bava

Bava Sathan
Associate

Raven House,
29 Linkfield Lane,
Redhill, Surrey
RH1 1SS



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New Arun Crematorium

Land Quality Statement

For
Crematoria Management Ltd.

Project Number:

13591

June 2021

Campbell Reith Hill LLP
Raven House
29 Linkfield Lane
Redhill
Surrey RH1 1SS

Document History and Status

Revision	Date	Purpose/Status	Author	Check	Review
F01	June 2021	For Information	PJW / DM	DM	ANF
D02	June 2021	For Information	PJW / DM	DM	ANF

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APPENDIX A: FIGURES

APPENDIX B: DESK STUDY INFORMATION

APPENDIX C: GEOLOGICAL SECTIONS

APPENDIX D: SITE INVESTIGATION INFORMATION

1.0 EXECUTIVE SUMMARY

SITE LOCATION AND PROPOSED DEVELOPMENT	The site location is north of Grevatt's Lane east of the town of Bilsham, BN18 0JZ, NGR SU 98002 01716. The proposed development is a crematorium with associated landscaping and parking.
ENVIRONMENTAL SETTING	The site lies at approximately 5m Above Ordnance Datum (AOD) with the general elevation reducing towards the south. The site is underlain by topsoil, which in turn is underlain by Brickearth deposits of silt or clayey-silt with flint fragments overlying River Terrace Deposits of sand, sandy gravel of quartz and sandstone. Made Ground is absent on the site. The site is underlain by bedrock of the Upper Chalk Formation. • Hydrogeology: medium sensitivity • Hydrology: medium/ high sensitivity
CURRENT USE AND HISTORY	The site is shown as undeveloped farmland on earliest mapping. The site is currently undeveloped farmland.
GEOTECHNICAL HAZARDS	• Compressible ground • Shallow / perched groundwater • Obstructions including flint bands • Soils susceptible to frost heave • Chalk dissolution • Volume change potential soils • Low permeability soils
CONTAMINATION ISSUES	The site has limited identified sources of contamination and the ground investigation did not identify Made Ground or contamination of concern on the site. Generally risks associated with contamination on the site were identified to be Very Low. Ground gas monitoring on the site indicates that ground gas protection measures are not required.
GEOTECHNICAL RECOMMENDATIONS	Dissolution Features There is no evidence for chalk dissolution on the site and the risk of dissolution is low and unlikely unless there is considerable flow of surface water. The presence of shallow groundwater across the site should be acknowledged, suitably controlled and measures should be in place to ensure drainage is not susceptible to damage. No evidence of dissolution features was encountered during the ground investigations however the presence of such features cannot be fully ruled out. Excavations Difficulties in excavating the swales and foundations are not anticipated due to the soft nature of the superficial deposits. Owing to the high groundwater measures should be in place to pump water and accommodate the high water table. Support or battering of the excavation faces may be required where man entry is necessary. Foundations The site is not suitable for shallow traditional foundations owing to the depth and strength of the superficial deposits. Piled foundations will be required for the proposed development. The piles will need to consider the potential for chalk dissolution and pile locations should be suitably investigated for potential dissolution features.

ENVIRONMENTAL RECOMMENDATIONS	Drainage BRE 365 soakaway tests indicated the superficial material is not suitable for infiltration drainage. Drainage infrastructure should be protected from the occurrence of settlement with flexible service connections and should be designed to mitigate against damage to prevent the egress of water into the chalk thereby forming dissolution features. Drainage should be wrapped in geotextiles to prevent the ingress of fines and silting up. Floor slabs Suspended floor slabs are recommended. Road Pavements A CBR of 2% is recommended where pavements is constructed in areas of soft and compressible material. The sub-grade for any pavement should be inspected prior to construction. Buried Concrete Buried concrete should be designed to Design Sulphate Class of DS-1 and an ACEC of AC-1.
	Generally remediation is not required. Remediation strategy / options appraisal and verification reporting is not required. Unforeseen contamination should be assessed in accordance with Land Contamination: Risk Management (LC:RM webpage). Reuse of soils on the site should be conducted under an MMP, or appropriate waste exemption.

7.0 SITE INVESTIGATION

Summary of Ground Investigation

7.1. Scope of Works

7.1.1. The recent site specific ground investigation was design by CampbellReith and undertaken by Harrison Group Environmental between the 12th and 21st of April 2021. The associated Factual Report is included in Appendix D. Where relevant, the previous phase of ground investigation from spring 2019 is referred to. The factual report from this phase is also presented in Appendix D.

7.1.2. The scheduled site work in the 2021 investigation comprised:

- 2 no. cable percussion boreholes (BH101 and BH102) to a depth of 20.0 m bgl and 18.38m bgl;
- 8 no. window sample boreholes (WS101 to WS108) to depths of 4.0m bgl to 5.0m bgl;
- 3 no. soakaway tests to BRE 365 pits to between 1.5m bgl and 1.7m bgl;
- 6 no. Dynamic Cone Penetration Tests to 1.0m bgl].

7.1.3. Each cable percussion borehole was scheduled to 20m bgl, however BH102 terminated early due to refusal at 18.15m bgl (-13.93m OD) on the chalk bedrock.

7.1.4. Each window sample was scheduled to 7.0m bgl, however each of the holes terminated early at 4.0m bgl or 5.0m bgl due to the collapse of the hole from 2.4m bgl to 4.0m bgl.

7.1.5. The exploratory hole plan (Figure 4) is included within Appendix A.

7.2. Installations, Monitoring and Observations

7.2.1. The ground conditions encountered with respect to the monitoring installations are summarised in Table 7.1. Visits have been made to site on 3 occasions on 27th April, 4th May and 11th May 2021 to monitor gas and water levels within the installations and to obtain samples. The full installation details, including response zones and monitoring results are presented in the Factual Ground Investigation Report.

TABLE 7.1: Standpipe Summary

Exploratory Hole	Response Zone (m bgl)	Response Zone Strata	
BH101	4.5 - 20.0	4.5 - 20.0	Chalk
BH102	5 - 18	5 - 18	Chalk
WS101	0.8 – 3.8	0.8 – 2.9	Brickearth
		2.9 – 3.6	River Terrace Deposits
		3.6 – 4.0	Weathered Chalk
WS102	1.0 – 3.5	1.0 – 2.9	Brickearth
		2.9 – 3.5	Chalk

Exploratory Hole	Response Zone (m bgl)	Response Zone Strata	
WS103	0.5 – 3.5	0.5 – 2.4	Brickearth
		2.4 – 3.5	Chalk
WS104	0.8 – 3.8	0.8 – 1.6	Brickearth
		1.6 – 3.0	River Terrace Deposits
		3.8 – 3.5	Brickearth
		3.5 – 3.8	River Terrace Deposits
WS105	0.9 – 3.9	0.9 – 2.4	Brickearth
		2.4 – 3.9	River Terrace Deposits
WS106	1.0 – 3.8	1.0 – 2.8	Brickearth
		2.8 – 3.8	Chalk
WS107	1.0 – 3.5	1.0 – 3	Brickearth
		3.0 – 3.5	Chalk
WS108	1.0 – 4.0	1.0 – 3.3	Brickearth
		3.3 – 4.0	Chalk

7.3. Groundwater Observations

7.3.1. Water strikes observed during the site works and the results of the monitoring visits are summarised in Table 7.2 below.

TABLE 7.2: Groundwater Observations

Exp Hole	Water Strikes				Standing Water Level During Monitoring			
	Struck		Rose to		Shallowest		Deepest	
	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD
BH02	2.7	-	-	-	-	-	-	-
BH03	2.8	-	-	-	-	-	-	-
BH101	1.0	3.31	-	-	0.81	3.5	1.66	2.65
BH102	-	-	-	-	0.83	3.39	1.13	3.09
WS101	-	-	-	-	1.27	3.43	1.49	3.21
WS102	-	-	-	-	1.11	3.15	2.02	2.24
WS103	-	-	-	-	0.9	3.21	1.01	3.1
WS104	-	-	-	-	0.84	3.34	1.6	2.58
WS105	-	-	-	-	0.92	3.45	1.05	3.32
WS106	-	-	-	-	1.15	2.75	1.93	1.97

Exp Hole	Water Strikes				Standing Water Level During Monitoring			
	Struck		Rose to		Shallowest		Deepest	
	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD
WS107	-	-	-	-	1.23	3.59	1.41	3.41
WS108	-	-	-	-	1.18	2.81	1.23	2.76

- 7.3.2. Typically groundwater was encountered at shallow depth within the cohesive Brickearth deposits. No deeper groundwater was encountered and the site is known to flood after prolonged rainfall.
- 7.3.3. The excavations of three trial pits for the use of soakaway testing were terminated early due to encountering groundwater.
- 7.3.4. The details of installations, including response zones and return monitoring sheets are presented within the Factual Report included within Appendix D.

7.4. Geotechnical Testing

- 7.4.1. In-situ testing was undertaken for geotechnical purposes and samples were obtained for appropriate laboratory analysis. The laboratory testing was scheduled by CampbellReith and undertaken by Harrison Testing Services and I" Analytical Ltd.
- 7.4.2. The test results are presented in the Factual Ground Investigation Report.

7.5. Contamination Observations and Testing

- 7.5.1. Generally Made Ground was not encountered on the site and no visual observations of contamination were recorded on logs with the exception of brick fragments in the topsoil of WS108. Table 9.1 describes the ground conditions encountered.
- 7.5.2. Table 7.3 summarises the contamination testing conducted.

TABLE 7.3: Laboratory Tests (Environmental)

Test type	Number
SOIL	
S 1.3 asbestos screen	7
S 1.4 Total organic Carbon	3
S 1.6 General suite including for waste classification, As, Be, B, Cd, Cr, Ni, Pb, Hg, Se, Cu, V, Zn, Hexavalent Chromium, Moisture Content, PAHs USEPA 16, EPH Banded (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, >C21), Sulphate (total), Sulphide, Phenols Monohydric (Total of Phenol+Cresol+Xylenol), Cyanide (total), pH	8
WATER	
W1.1, As, Cd, Cr, Cu, Ni, Zn, Pb, Hg, B, Se, hex Cr, Total cyanide, free cyanide, thiocyanate, PAH (total), TPH (total), phenol (total), Sol sulphate, sulphide, free sulphur, pH	10

- 7.5.3. It is noted that pesticides and herbicides are identified as potential sources of contamination in Table 6.2. It is considered that given the absence of visual evidence of pesticide and herbicide use, and the absence of stores where pesticides and herbicides may be stored, it is considered that the associated potential for significant contamination of this nature is considered to be low and as such, testing was not conducted.

Particle Size Distribution (PSD)

9.5.14. Two PSD tests were undertaken on samples of Brickearth recording the following values:

- Fines – 50.9% to 56.7%;
- Sand – 13.1% to 13.4%; and
- Gravel – 30.1% to 35.7%.

9.5.15. The results indicate the material is classified as a fine soil.

Intact dry density

9.5.16. Four samples of the chalk were tested for saturation moisture content and intact dry density recording 1.59Mg/m³ to 1.71Mg/m³ indicating a chalk of medium density and an approximate UCS of 3 to 5MN/m² as detailed in Ciria C574.

Undrained Shear Strength

9.5.17. A single triaxial unconsolidated undrained shear strength tests were undertaken on a sample of the structureless chalk at 13.5m bgl recording a value of 860kN/m².

Table 9.4: Summary of Soil Parameters for structureless chalk

Soil Parameters	Number of tests	Range of results
Liquid Limit (%)	1	27
Plastic Limit (%)		21
Plasticity Index (%)		6
Modified Plasticity Index %)		5
Volume Change Potential (NHBC)		Low
Moisture Content (%)	4	22 - 23
SPT 'N ₆₀ ' Values	26	12 - 49
Undrained Shear Strength (kN/m ²)	1	860
Intact Dry Density (Mg/m ³)	4	1.59 – 1.71

9.6. Buried Concrete

9.6.1. A total of nine soil samples from the Brickearth were subjected to pH and water soluble sulphate determinations. With reference to BRE Digest SD1 (2005 Ed), the results indicate a DS-1 and ACES AS-1 class.

9.7. Soakaway Tests

9.7.1. Three soakaway tests in accordance with BRE 365 [3] were undertaken in pits excavated to 1.5m bgl to 1.7m bgl. Owing to the cohesive nature of the material no infiltration rate was reported.

9.8. Groundwater Conditions

9.8.1. Groundwater observations during the field and the subsequent monitoring are described in Section 7 and are summarised in Table 7.2.

- 9.8.2. During the 2021 site investigation only BH101 recorded groundwater at 1.0m bgl. During the return monitoring visits standing water was recorded in all of the exploratory holes at 0.81m bgl to 2.02m bgl.
- 9.8.3. The groundwater was recorded at a consistently shallow depth across the site within the upper layer of Brickearth deposits and are considered to be representative of groundwater rather than perched groundwater.
- 9.8.4. The site is known to flood following periods of heavy rain and for the purpose of design it is recommended that the groundwater level is considered to be located at the ground surface.

Appendix B: Desk Study Information

Contents

HARRISON GROUP ENVIRONMENTAL LIMITED

Document: Ground Investigation Factual Report

Project: Central Arun Crematorium

Reference No.: GL22428B

Date: April 2019

Prepared For: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd.

Engineer: Campbell Reith Hill LLP

REPORT STATUS:

		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
		INIT SIGN	INIT SIGN	INIT SIGN	INIT SIGN
		COMMENTS DATE	COMMENTS DATE	COMMENTS DATE	COMMENTS DATE
FINAL	REV 1	INIT JS SIGN	INIT MC SIGN	INIT JS SIGN	INIT MC SIGN
		COMMENTS DATE 17/04/2019	COMMENTS DATE 17/04/2019	COMMENTS DATE 17/04/2019	COMMENTS DATE 17/04/2019
Revision	Comments	Prepared By	Approved By	Issued By	Audited By

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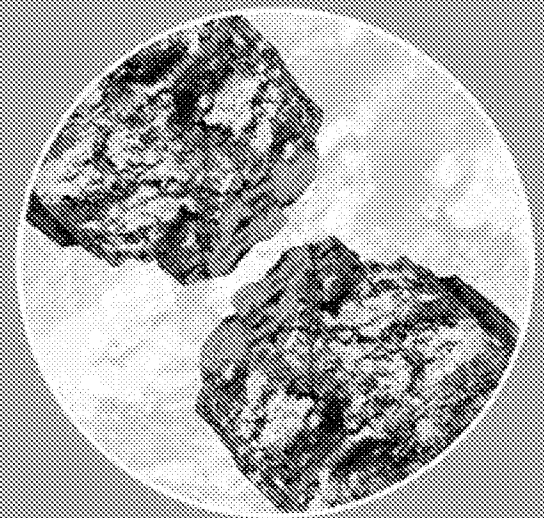
Auditors to insert their comments on the table, to annotate the report itself or provide comments on a separate sheet. (Please state which)

For final reports a hard copy of the signed off form will be kept on the appropriate QA file.



Document: Ground Investigation Factual Report
Project: Central Arun Crematorium
Reference No: GL22428B
Date: April 2019
Prepared for: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd.
Engineer: Campbell Reith Hill LLP

harrisongeotechnical
ENGINEERING



A division of Harrison Group Environmental Limited

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REFERENCES

APPENDICES

FOREWORD

General Conditions Relating To Site Investigation

This investigation has been devised to generally comply with the relevant principles and requirements of BS10175:2001+A2:2017 "Investigation of potentially contaminated sites - Code of practice" and where directed by the principles and application rules of Eurocode 7 (EC7 – Part 1 and Part 2). The recommendations made and opinions expressed in this report are based on the information obtained from the sources described using a methodology intended to provide reasonable consistency and robustness.

The opinions expressed in this report are based on the ground conditions revealed by the site works, together with an assessment of the site and of laboratory test results. Whilst opinions may be expressed relating to sub-soil conditions in parts of the site not investigated, for example between exploratory positions, these are only for guidance and no liability can be accepted for their accuracy.

Boring, sampling and field test procedures are undertaken in accordance with BS5930:2015 "Code of Practice for Site Investigations". Likewise in-situ and laboratory testing complies with B.S.1377, "Methods of Tests for Soils for Civil Engineering Purposes", unless stated otherwise in the text.

The groundwater conditions entered on the boring records are those observed at the time of investigation. The normal rate of boring usually does not permit the recording of an equilibrium water level for any one water strike. Moreover, groundwater levels are subject to seasonal variation or changes in local drainage conditions.

Some items of the investigation have been provided by third parties and whilst Harrison Group have no reason to doubt the accuracy, the items relied on have not been verified. No responsibility can be accepted for errors within third party items presented in this report.

This report is produced for the benefit of the client alone. No responsibility can be accepted for any consequences of this information being passed to a third party who may act upon its contents/recommendations.

**FACTUAL REPORT
ON A
GROUND INVESTIGATION
AT
CENTRAL ARUN CREMATORIUM**

1.0 TERMS OF REFERENCE AND INTRODUCTION

The work covered by this report was undertaken on behalf of Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd by Harrison Group Environmental Ltd (HGE). The work was undertaken in accordance with the relevant contract documentation and the Campbell Reith Hill LLP (Campbell Reith) Specification for Ground Investigation Tender Document Project (TET-13062-311018). Campbell Reith acted as Consulting Engineer.

The purpose of the investigation was to provide factual geotechnical and geo-environmental data from the fieldwork and subsequent laboratory testing which will be used to assist with the design for the development of the site.

This report presents the results of the fieldwork, associated laboratory testing and post fieldwork monitoring.

2.0 LOCATION AND DESCRIPTION OF SITE

The site is a partly contained arable field parcel adjacent to Grevatt's Lane West, Bilsham, BN18 0LA with a National Grid Reference of 497979E and 101697N. It is proposed to develop the site with a crematorium and associated access, car parking and landscaping.

A site location plan (GL22428B-DR001) is presented in Appendix A.

3.0 EXPECTED GEOLOGY

The site is recorded to be underlain by superficial River Terrace Deposits into Chalk bedrock. Borehole recorded indicate an initial layer of Brickearth up to ~2m bgl and Raised Beach Deposits up to ~5m bgl moving into the Upper Chalks.

4.0 FIELDWORK

The scope of the site works was generally in accordance with that proposed by Campbell Reith and comprised the following:

- Utility clearance of the exploratory locations (carried out by Midland Surveys Ltd)
- Dynamic Continuous Sampling (Windowless Sampler) boreholes (2 No. to maximum depth of 5.45mbgl)
- Hand Dug Percolation Testing Pits. (2 No. to depth of 0.50m)

- Groundwater monitoring of installations (5 No. monthly rounds completed)
- Decommissioning of window sample boreholes

The main intrusive fieldwork was carried out by HGE on the 20th December 2018, Percolation testing was carried out between 25th - 28th March 2019 and the window sample holes were decommissioned on the 25th March 2019. All exploratory locations are detailed on the appended drawing GL22428B - DR002 Rev B –presented in Appendix A.

In addition to consulting all available service plans, lifting all available covers and prior to intrusive activities taking place, service clearance was carried out using Ground Penetrating Radar (GPR). Service inspection pits were also dug at borehole locations to clear near surface utilities.

The sampling strategy was designed by Campbell Reith and considered local site constraints, topography of the site, the geology encountered, including made ground and the development proposals.

During and immediately following completion of the fieldwork geotechnical samples were transported to Harrison Group Geotechnical Laboratory via in house transportation where, upon arrival, they were logged into a sample management system. Following receipt of the CampbellReith geotechnical schedules, certain geotechnical samples were subsequently dispatched to laboratory subcontractors via a courier.

4.1 Dynamic Continuous Sampling (Windowless Sampler) Boreholes

2 No. dynamic sampler boreholes, BH02 and BH03 were drilled on the 20th December 2018 using a dual-purpose tracked rig. Each position was progressed to a depth of between 4.90mbgl and 5.45mbgl, in order to identify, sample and test the underlying sub-soils.

BH01 was cancelled due to the ground conditions encountered.

Upon completion, BH02 and BH03 were installed with groundwater monitoring wells (19mm), as summarised in Table 4.2.

A detailed description of all the strata encountered, in-situ testing undertaken, position and types of samples taken along, with any groundwater observations made at the time of drilling are included on the dynamic sampling borehole records presented in Appendix B.

4.2 Percolation Testing

2 No. percolation tests were carried out between 25th and 28th of March 2019. The tests were conducted in hand dug pits (PO01 and PO02) in accordance with BS 6297:2007+A1:2008 at locations set out by the engineers (Campbell Reith Hill LLP) that were in turn GPS located and service cleared by an independent specialist.

The pits were dug to 0.50m bgl (0.30m x 0.30m LxW) then filled with water to ground level and allowed to drain completely before the tests were carried out as specified in the relevant code of practice. Table 4.2 below summarises the results.

Test Type and Reference	Number	Results (Vp) (Vp = s/mm)	Comments / Limitations
Percolation test (BS 6297:2007:A1:2 008)	2	PO01 - 60.53 PO02 - 142.21	The two positions had very different Vp values, with PO01 having a much quicker average drain time than PO02. PO02 is above the Vp limit of 100. Drainage field disposal should only be used when percolation tests indicate average values of Vp between 15 and 100 and the preliminary assessment of the trial hole is favorable. A value of 15 ensures untreated effluent cannot percolate too rapidly and potentially result in groundwater pollution. Where Vp is above 100 effective treatment is

Test Type and Reference	Number	Results (Vp) (Vp = s/mm)	Comments / Limitations
			unlikely to take place in a drainage field and potentially cause ponding of wastewater due to insufficient soakage.

Table 4.2: Summary of Percolation tests

A detailed description of all the strata encountered, in-situ testing undertaken, position and types of samples taken along, with any groundwater observations made at the time of digging are included on the hand dug trial pit records presented in Appendix B.

4.3 Installation

Both dynamic continuous sampling boreholes were installed with standpipes for monitoring the groundwater within the soils encountered. Table 4.2 below summarises these installations.

Monitoring Point I.D	Diameter of Installation (mm)	Base Depth of Installation (mbgl)	Response Zone (mbgl)	
			Top	Base
BH02	19	4.00	1.00	4.00
BH03	19	5.00	1.00	5.00
PO02 (Installed 26.03.2019 – Decommissioned 27.03.2019)	50	1.20	0.50	1.20

Table 4.2: Summary of Groundwater Installations.

Detailed descriptions of the installations and their corresponding backfill materials are included on the relevant exploratory borehole logs presented in Appendix B.

4.4 Surveying

Pre-intrusive works were undertaken by an independent specialist who cleared proposed exploratory locations utilising a range of techniques including Ground Penetration Radar (GPR).

4.5 Groundwater Monitoring

Five rounds of groundwater monitoring have been undertaken on the HGE borehole installations on the following dates:

- Round 1 – 21st December 2018
- Round 2 – 8th January 2019
- Round 3 – 5th February 2019
- Round 4 – 6th March 2019
- Round 5 – 25th March 2019

The results of the water strikes encountered during the intrusive works are detailed on the relevant logs presented in Appendix B. The standing groundwater water levels from the subsequent monitoring rounds detailed above are presented in Appendix C.

5.0 GEOTECHNICAL TESTING

Use of the laboratory and field tests presented below to establish geotechnical parameters should be carried out in accordance with BS EN 1997-2 Eurocode Part 2.

5.1 In-Situ Testing

In-Situ testing was undertaken for geotechnical purposes and samples were obtained for appropriate laboratory analysis. Site based geotechnical testing is presented in the Appendix B and summarised in Table 5.1 on the following page.

Test Type and Reference	Number	Comments / Limitations
Standard penetration test (BS EN ISO 22476-3:2005)	10	Standard Penetration Tests (SPTs) display a general trend of increasing in value with depth below ground level. Non calibrated SPT hammers can result in a wide variance between reported results. It should be noted we report raw SPT N values rather than corrected $N_{(60)}$ values. However, calibration certificates are provided in Appendix F so as to enable $N_{(60)}$ values to be calculated if required.

Table 5.1: Summary of In-Situ Geotechnical Testing

The dynamic continuous sampler (windowless sampler) borehole SPT Hammer Test Report (SPT Hammer Ref: 382709 / 87.82%) is presented in Appendix F.

5.2 Geotechnical Laboratory Testing

Geotechnical laboratory testing scheduled by Campbell Reith on selected soil samples recovered from the exploratory holes, was carried out to identify the physical characteristics of the soils encountered.

A summary of the results can be found in Table 5.2 on the following page.

APPENDIX C

GAS & GROUNDWATER MONITORING RECORDS



Site Name: Central Arun Crematorium Job No.: GL22428B

Site Name: Central Arun Crematorium

Job No.: GL22428B

Weather (include Temperature & Pressure): Wet, overcast

State of Ground: Wet

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ



Site Name: Central Arun Crematorium Job No.: GL22428B

Site Name: Central Arun Crematorium

Job No.: GL22428B

Weather (include Temperature & Pressure): Dry, clear

State of Ground: Dry

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ



Site Name:	Central Arun Crematorium	Job No.:	GL22428B
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Site Name: Central Arun Crematorium

Job No.: GL22428B

Weather (include Temperature & Pressure): Dry, clear

State of Ground: Dry

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ



Site Name: Central Arun Crematorium

Job No.: GL22428B

Client: Trustees of the Langmead Pension Scheme c/o Landlink Estates Ltd.

Weather (include Temperature & Pressure): Dry, clear

State of Ground: Dry

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ



Site Name: Central Arun Crematorium Job No.: GL22428B

Site Name: Central Arun Crematorium

Job No.: GL22428B

Weather (include Temperature & Pressure): Dry, clear

State of Ground: Dry

Harrison Group Environmental Ltd. Unit 12
Waterways Business Centre
Enfield
EN3 6JJ

APPENDIX E

PERCOLATION TESTING RESULTS

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Hours/Minutes/Seconds	Seconds		
PO01	0.30m - 0.60m / Slightly gravelly CLAY	01Hrs 36mins 39secs	5799	38.66	8.61E-06
		01Hrs 27mins 12secs	5232	34.88	9.56E-06
		04Hrs 30mins 07secs	16207	108.05	3.09E-06
Average				60.53	7.09E-06

Location ID	Test Depth/ Soil Type	Elapsed Time		Vp (s/mm)	Equivalent Infiltration Rate (m/s)
		Minutes	Seconds		
PO02	0.30m - 0.60m / Slightly sandy CLAY	05Hrs 19mins 19secs	19159	127.73	2.61E-06
		06Hrs 31mins 45secs	23505	156.70	2.13E-06
		Insufficient time to complete third infilling			
Average				142.21	2.37E-06

London

15 Bermondsey Square
London
SE1 3UN

Birmingham

Chantry House
High Street, Coleshill
Birmingham B46 3BP

Surrey

Raven House
29 Linkfield Lane, Redhill
Surrey RH1 1SS

Manchester

No. 1 Marsden Street
Manchester
M2 1HW

Bristol

Wessex House
Pixash Lane, Keynsham
Bristol BS31 1TP

Campbell Roth Hill LLP, Registered in England & Wales, Limited Liability Partnership No OC300082
A list of Members is available at our Registered Office at: 15 Bermondsey Square, London, SE1 3UN
VAT No 974 809242



West Sussex Flood Risk Partnership

Our ref: LDC/ARUN/2021/015

Your ref:

Date: 1st November 2021

Mr C Longhurst
Paul Basham Associates
Suite 4 Hitching Court
Blacklands Way
Abingdon Business Park
Abingdon
OX14 1RG

Dear Craig

**RE: Land Drainage Works – Arun Crematorium, Grevatts Lane West/A259
Grevatts Lane, Yapton (Highway Improvements)**

Thank you for your application for Ordinary Watercourse Land Drainage Consent.

I confirm that your proposals for the permanent / ~~temporary~~* works are approved by the West Sussex Drainage Partnership. I enclose consent number LDC/ARUN/2021/015 issued under Section 23 of the Land Drainage Act 1991.

Please notify this authority no less than seven days before commencement and upon completion of the works via one of the methods of contact below, quoting the above consent number for reference. Please note that inspections will be carried out as deemed necessary.

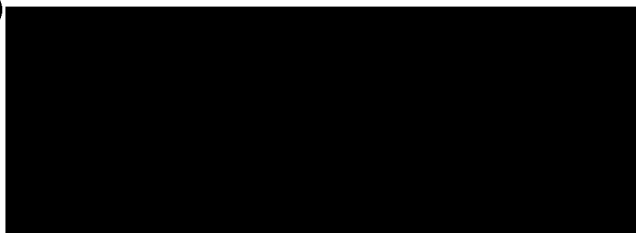
The applicant must provide photographs of the works during construction and on completion, and forward digital copies to this office. **Please note the 'Conditions' attached to this approval.**

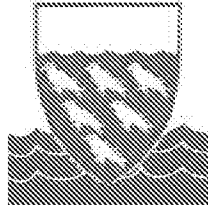
Yours sincerely



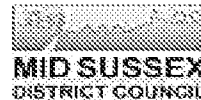
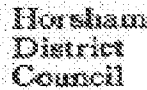
Mr Paul Cann
Principal Engineer (Drainage)

Arun District Council
Engineering Services
Arun Civic Centre
Maltravers Road
Littlehampton
West Sussex
BN17 5LF





West Sussex Flood Risk Partnership



Ordinary Watercourse Land Drainage Consent

Land Drainage Act 1991

Name:

Crematoria Management Limited

Consent applying to:

Reprofiling and connections to watercourse, Grevatts Lane West/A259 Grevatts Lane, Yapton

Consent Number LDC/ARUN/2021/015

**Effective from
1st November 2021**

This note does not form part of the Certificate of Authorisation.

Introduction

The West Sussex Drainage Partnership

The West Sussex Drainage Partnership is a body consisting of West Sussex County Council and the District and Borough Authorities within West Sussex acting together in partnership, to carry out specific duties under the Land Drainage Act 1991 and Flood and Water Management Act 2010. It operates under delegated powers under section 13(4) of the Flood and Water Management Act 2010.

The Partnership aims to manage flood risk in the county through continued maintenance and regulation of ordinary watercourses, education and assistance of riparian ("river side") owners and through promotion of sustainable drainage systems (SuDS).

Legislation

Land Drainage Consents are required by virtue of the Land Drainage Act 1991. The following activities on an Ordinary (non-main) Watercourse require Local Authority Consent:

under Section 23 of the Land Drainage Act 1991;

- the erection or alteration of any mill dam, weir or other like obstruction to the flow of any watercourse
- the erection or alteration of any culvert that would be likely to affect the flow of any watercourse

under Sections 17 and 20(2) of the Land Drainage Act 1991

- any drainage works carried out by a local authority against flooding in connection with any watercourse

under Section 61F Land Drainage Act 1991 (Inserted by Schedule 22 Environment Act 1995)

- the operation of any drainage works, under the control of any Internal Drainage Board or local authority, so as to manage the level of water in a watercourse for the purposes of facilitating spray irrigation.

Note: Consent under the above legislation is required irrespective of whether the works are permanent or temporary.

Contraventions

In relation to Ordinary Watercourses, West Sussex Drainage Partnership can under Section 24 of the Land Drainage Act 1991 serve a legal notice requiring the person to abate the nuisance within a specified time. Failure to abide by such a notice can result in the West Sussex Drainage Partnership carrying out the necessary remedial work and seeking to recover costs.

Land Drainage Act 1991

Land Drainage Consent

Control of works affecting watercourses and/or flood defences

Consent number LDC/ARUN/2021/015

To: Crematoria Management Limited

The West Sussex Drainage Partnership in exercise of its powers under Section 23 of the Land Drainage Act 1991 and subject to the conditions attached, hereby grants its consent in relation to the works or operations described in this Consent.

Watercourse: Not named

Location: Junction of Grevatts Lane West & Grevatts Lane (A259)

Map reference: SZ 4980 1015

Description of works: Three number connections to watercourses with headwalls, all 225mm diameter pipes. Each outfall with flows restricted to <2 l/s. Reprofilng of existing watercourse as shown.

As detailed on plans and sections

Drg no. S278/38/23 Rev A, 128.5004.100 Rev A, 128.5004.107 Rev D, 128.5004.108 Rev C, 128.5004.114 Rev B

In supporting documentation

The West Sussex Drainage Partnership does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

This Consent shall come into effect on

Date 1st November 2021

Signed on behalf of the West Sussex Drainage Partnership




Mr Paul Cann
Principal Engineer (Drainage)

Date of signing

1st November 2021

Conditions

This consent is granted with the following conditions:

General

N/A

Timing

Works to be completed within six months of the date of this consent or else the consent will be deemed to have expired.

Temporary Works

N/A

Site Specific

Existing ditches upstream and downstream to be cleaned out/regraded to suit.

Existing culverts to be investigated as noted on drawings.

Other Information

This Consent does not remove from the applicant the necessity to obtain other licences, consents, approvals or permissions (including planning permission) which may be required in law or in order to comply with any duties or responsibilities for conservation or protection of the environment.

It is the applicants responsibility to ensure that he obtains the consent / permission of any owners and occupiers affected by the works.

This Consent does not confer any rights of entry or rights over property.

Works should be arranged to ensure there is no increase in flood risk to third parties.

That the LLFA does not accept any responsibility for the design and construction of the works that are the subject of this Consent and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

The works must be undertaken in accordance with the approved plans, drawings, calculations, specifications and other relevant documents.

All reasonable precautions must be taken during the undertaking of the works so as not to obstruct, impede or interfere with the flow of water in, into or out of the watercourse and not to damage the banks or bed or any drainage works without the approval of the Lead Local Flood Authority.